

WHAT IS CLAIMED IS:

1. A composition for preparing substances having a porous interlayer dielectric thin film, said composition comprising:

a saccharide or saccharide derivative;

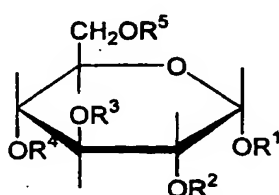
a thermo-stable organic or inorganic matrix precursor; and

a solvent for dissolving both the saccharide or saccharide derivative and the matrix precursor.

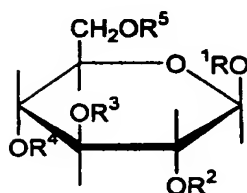
2. The composition according to claim 1, wherein the content of the saccharide or saccharide derivative is 0.1~95 wt.% of the solid components(the matrix precursor + the saccharide or saccharide derivative).

3. The composition according to claim 1, wherein the content of the solvent is 20.0~99.9 wt.% of the compositions(the matrix precursor + the saccharide or saccharide derivative + the solvent).

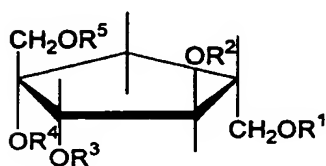
4. The composition according to claim 1, wherein the saccharide or saccharide derivative is selected from the group consisting of one or more monomeric saccharide derivatives represented by the following formulas (8) to (10):



(8)



(9)



(10)

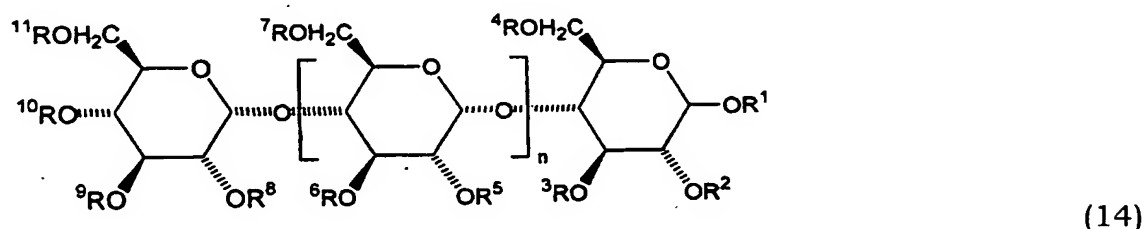
in which, R₁, R₂, R₃, R₄ and R₅ are independently a hydrogen atom, C₂₋₃₀ acyl group, a C₁₋₂₀ alkyl group, a C₃₋₁₀ cycloalkyl group, a C₆₋₃₀ aryl group, a C₁₋₂₀ hydroxy alkyl group, or a C₁₋₂₀ carboxyl group.

5. The composition according to claim 1, wherein the saccharide or saccharide derivative is selected from the group consisting of disaccharide derivatives represented by the following formulas (11) to (13):



in which, R_1 , R_2 , R_3 , R_4 , R_5 , R_6 , R_7 and R_8 are independently a hydrogen atom, a C_{2-30} acyl group, a C_{1-20} alkyl group, a C_{3-10} cycloalkyl group, a C_{6-30} aryl group, a C_{1-20} hydroxy alkyl group, or a C_{1-20} carboxy alkyl group.

6. The composition according to claim 1, wherein the saccharide or saccharide derivative is selected from the group consisting of polymeric saccharide derivatives represented by the following formula (14)



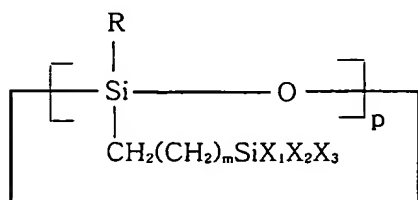
in which, R_1 , R_2 , R_3 , R_4 , R_5 , R_6 , R_7 , R_8 , R_9 , R_{10} and R_{11} are independently a hydrogen atom, a C_{2-30} acyl group, a C_{1-20} alkyl group, a C_{3-10} cycloalkyl group, a C_{6-30} aryl group, a C_{1-20} hydroxy alkyl group, or a C_{1-20} carboxyl group and n is an integer ranging from 1 to 20.

7. The composition according to claim 1, wherein the saccharide or saccharide derivative is selected from the group consisting of glucose, glucopyranose pentabenzoate, glucose pentaacetate, galactose, galactose pentaacetate, fructose, sucrose, sucrose octabenzoate, sucrose octaacetate, maltose and lactose.

8. The composition according to claim 1, wherein the matrix precursor is silsesquioxane, alkoxy silane sol, or siloxane-based polymer.\

9. The composition according to claim 8, wherein the silsesquioxane is hydrogen silsesquioxane, alkyl silsesquioxane, aryl silsesquioxane, or a copolymer thereof.

10. The composition according to claim 1, wherein the matrix precursor is a siloxane-based resin which is prepared by the hydrolysis and polycondensation of one or more monomers selected from the group consisting of compounds represented by the following formulas (1) to (4), using a catalyst and water in an organic solvent:



(1)

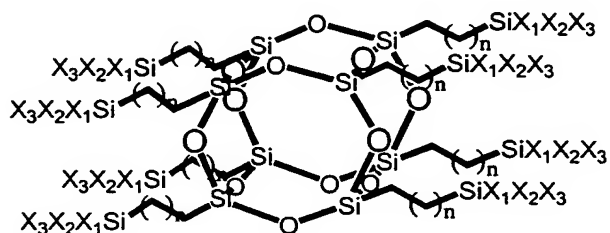
in which, R is a hydrogen atom, a C₁₋₃ alkyl group, a C₃₋₁₀ cycloalkyl group, or a C₆₋₁₅ aryl group;

X₁, X₂ and X₃ are independently a C₁₋₃ alkyl group, a C₁₋₁₀ alkoxy

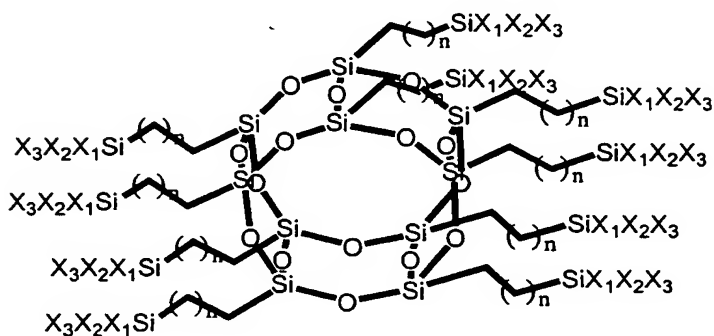
group, or a halogen atom, and at least one of them is a hydrolysable group;

p is an integer ranging from 3 to 8;

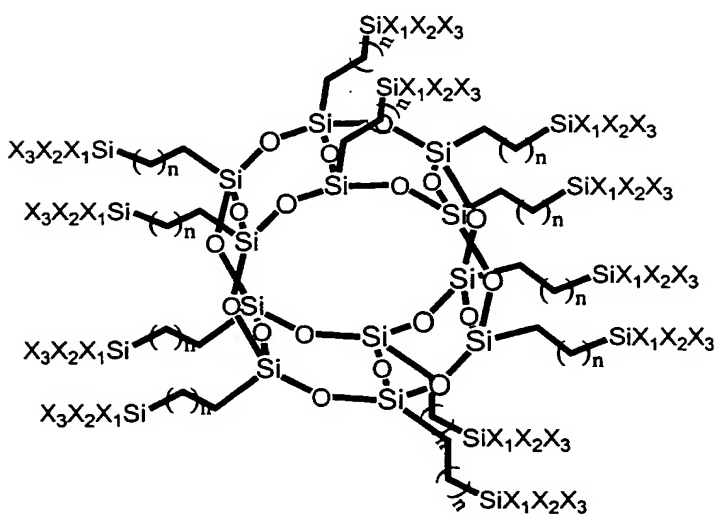
m is an integer ranging from 0 to 10; and



(2)



(3)



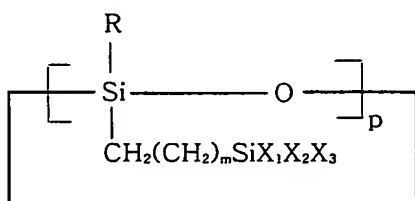
(4)

in which, X_1 , X_2 and X_3 are independently a C_{1-3} alkyl group, a C_{1-10} alkoxy

group, or a halogen atom, and at least one of them is hydrolysable; and

n is an integer ranging from 1 to 12.

11. The composition according to claim 1, wherein the matrix precursor is siloxane-based resin which is prepared by hydrolysis and polycondensation of a mixture of one or more monomers selected from the group consisting of compounds represented by the following formulas (1) to (4) together with one or more silane-based monomers selected from the group consisting of compounds represented by the following formulas (5) to (7) using a catalyst and water in an organic solvent:



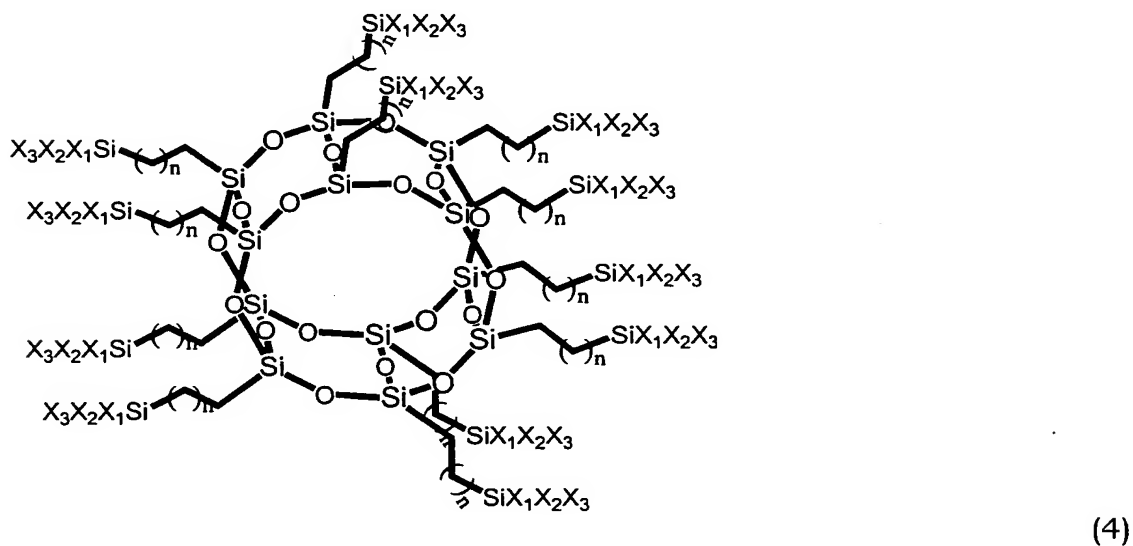
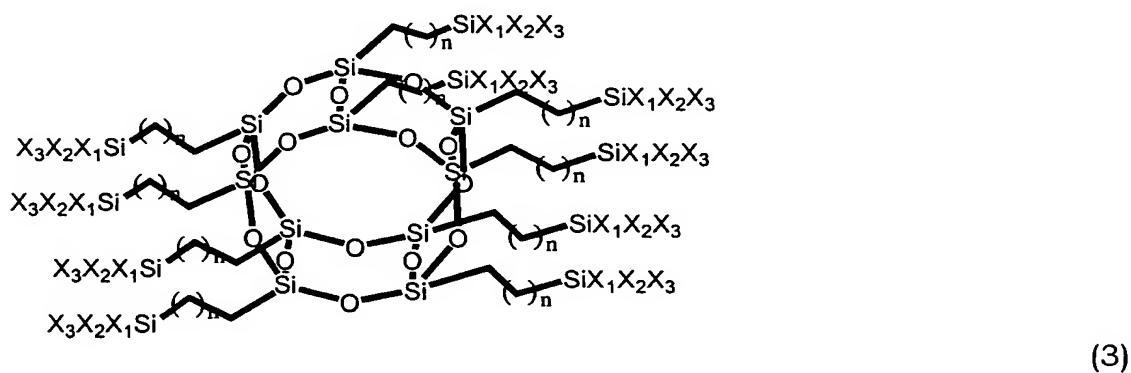
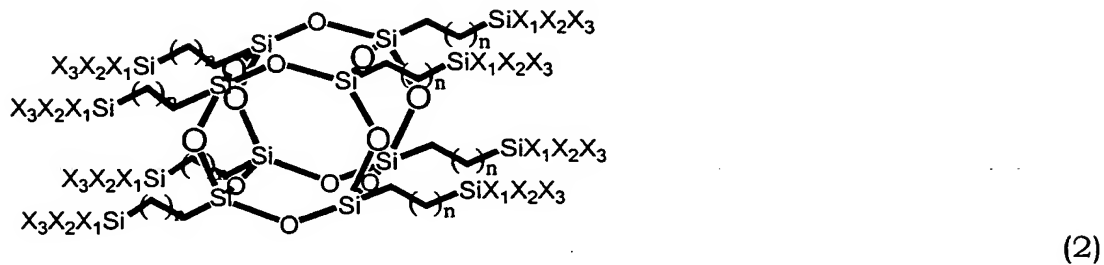
(1)

in which, R is a hydrogen atom, a C₁₋₃ alkyl group, a C₃₋₁₀ cycloalkyl group, or a C₆₋₁₅ aryl group;

X₁, X₂ and X₃ are independently a C₁₋₃ alkyl group, a C₁₋₁₀ alkoxy group, or a halogen atom, and at least one of them is a hydrolysable group;

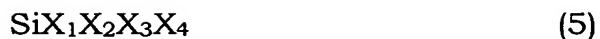
p is an integer ranging from 3 to 8;

m is an integer ranging from 0 to 10; and



in which, X_1 , X_2 and X_3 are independently a C_{1-3} alkyl group, a C_{1-10} alkoxy group, or a halogen atom, and at least one of them is hydrolysable;

n is an integer ranging from 1 to 12; and



in which, R_1 and R_2 are respectively a hydrogen atom, a C_{1-3} alkyl group, a C_{3-10} cycloalkyl group, or a C_{6-15} aryl group; and

X_1 , X_2 , X_3 and X_4 are independently a C_{1-3} alkyl group, a C_{1-10} alkoxy group, or a halogen atom.

12. The composition according to claim 10, wherein the content of the matrix precursor is more than 10 mol%.

13. The composition according to claim 11, wherein the content of the matrix precursor is more than 10 mol%.

14. The composition according to claim 11, wherein the mole ratio of the siloxane monomers having a cyclic or cage structure to the silane-based monomers is 0.99:0.01~0.01:0.99.

15. The composition according to claim 1, wherein the matrix precursor is a polyimide, polybenzocyclobutene, a polyarylene, or a mixture thereof.

16. The composition according to claim 1, wherein the solvent is an aromatic hydrocarbon-based solvent, a ketone-based solvent, an ether-based solvent, an acetate-based solvent, an amide-based solvent, γ -butyrolactone, a silicon-based solvent, or a mixture thereof.

17. A method for forming a dielectric thin film between interconnect layers in semiconductor device, said method comprising:

coating a composition comprising a saccharide or saccharide derivative, a thermo-stable organic or inorganic matrix precursor, and a solvent for dissolving both the saccharide or saccharide derivative and the matrix precursor on a substrate through spin-coating, dip-coating, spray-coating, flow-coating, or screen-printing;

evaporating the solvent therefrom; and

heating the coating film at 150~600°C in an inert gas atmosphere or

under vacuum conditions.

18. The method according to claim 16, wherein the coating is carried out by spin-coating at 1000~5000rpm.

19. A substance having nano-pores, said substance being prepared by using a composition comprising a saccharide or saccharide derivative, a thermo-stable organic or inorganic matrix precursor, and a solvent for dissolving both the saccharide or saccharide derivative and the matrix precursor.

20. A dielectric thin film having substantially evenly distributed nano-pores with a diameter of less than 50Å, said dielectric thin film prepared from a composition comprising:

a saccharide or saccharide derivative;

a thermo-stable organic or inorganic matrix precursor; and

a solvent for dissolving both the saccharide or saccharide derivative and the matrix precursor.

21. A semiconductor device containing the porous dielectric thin film of claim 20.